Ontario Geological Survey

Northern Ontario
Engineering Geology Terrain Study 40

PAKASHKAN LAKE AREA

(NTS 52G/SE)

Districts of
Kenora, Rainy River, and Thunder Bay

Compliments of
ONTARIO DEVELOPMENT
MINISTRY OF NORTHERN AFFAIRS AND MINES
Not for resale

by

J.G. Mollard and J.D. Mollard

1980

Ontario

Ministry of Natural Resources
Hon. James A.C. Auld, Minister
Dr. J.K. Reynolds, Deputy Minister

Ministry of Northern Affairs
Hon. Leo Bernier, Minister
Art Herridge, Deputy Minister

93-02305/

© OMNR-OGS 1980
Printed in Canada

THIS PROJECT WAS FUNDED BY
THE ONTARIO MINISTRY OF NORTHERN AFFAIRS
AND IS MANAGED BY
THE ONTARIO MINISTRY OF NATURAL RESOURCES

Every possible effort is made to ensure the accuracy of the information contained in this report, but the Ministry of Natural Resources does not assume any liability for errors that may occur. Source references are included in the report and users may wish to verify critical information.

Publications of the Ontario Ministry of Natural Resources and price list are available through the *Map Unit, Public Service Centre, Room 6404, Whitney Block, Queen's Park, Toronto,* and the *Ontario Government Bookstore, 880 Bay Street, Toronto.*

Orders for publications should be accompanied by cheque or money order payable to the *Treasurer of Ontario.*

ISSN 0709-4671
ISBN 0-7743-4316-8

Parts of this publication may be quoted if credit is given. It is recommended that reference to this report be made in the following form:

Mollard, D.G., and Mollard, J.D.
1980: Pakashkan Lake Area (NTS 52G/SE), Districts of Kenora, Rainy River, and Thunder Bay; Ontario Geological Survey, Northern Ontario Engineering Geology Terrain Study 40, 24 p. Accompanied by Map 5065, scale 1:100 000.

1200-80-H of C

CONTENTS

		Page
1.0	Introduction	1
2.0	Physiography and Geological Setting	2
3.0	Engineering Terrain Units	4
3.1	Bedrock Knob (RN)	5
3.1.1	Description	5
3.1.2	Occurrence	5
3.1.3	Engineering and Planning Significance	5
3.2	Bedrock Plain (RP)	6
3.2.1	Description	6
3.2.2	Occurrence	6
3.2.3	Engineering and Planning Significance	6
3.3	Bedrock Ridge (RR)	7
3.3.1	Description	7
3.3.2	Occurrence	7
3.3.3	Engineering and Planning Significance	7
3.4	End Moraine (ME)	8
3.4.1	Description	8
3.4.2	Occurrence	8
3.4.3	Engineering and Planning Significance	8
3.5	Ground Moraine (MG)	9
3.5.1	Description	9
3.5.2	Occurrence	9
3.5.3	Engineering and Planning Significance	10
3.6	Ice-Contact Delta (GD)	10
3.6.1	Description	10
3.6.2	Occurrence	10
3.6.3	Engineering and Planning Significance	11
3.7	Esker (GE)	11
3.7.1	Description	11
3.7.2	Occurrence	12
3.7.3	Engineering and Planning Significance	12
3.8	Kame (GK)	12
3.8.1	Description	12
3.8.2	Occurrence	13
3.8.3	Engineering and Planning Significance	13

3.9 Outwash Plain (GO) 13
3.9.1 Description 13
3.9.2 Occurrence 13
3.9.3 Engineering and Planning Significance 14
3.10 Alluvial Plain (AP) 14
3.10.1 Description 14
3.10.2 Occurrence 14
3.10.3 Engineering and Planning Significance 15
3.11 Sand Dune (ED) 15
3.11.1 Description 15
3.11.2 Occurrence 15
3.11.3 Engineering and Planning Significance 16
3.12 Organic Terrain (OT) 16
3.12.1 Description 16
3.12.2 Occurrence 16
3.12.3 Engineering and Planning Significance 17
4.0 Appendix: Examples of Terrain Unit Letter Codes 18
4.1 Simple Terrain Unit 18
4.2 Complex Terrain Unit 19
5.0 References 23

FIGURE

1 - Map of the Quetico - Nipigon area showing moraines and orientation of glacial features. 3

MAP
(accompanying report)

Map 5065 (coloured) - Northern Ontario Engineering Geology Terrain Study, Data Base Map, Pakashkan Lake (NTS 52G/SE). Scale 1:100 000.

Northern Ontario
Engineering Geology Terrain Study 40

PAKASHKAN LAKE AREA

(NTS 52G/SE)

Districts of Kenora, Rainy River,
and Thunder Bay

by

D.G. Mollard[1] and J.D. Mollard[2]

1.0 INTRODUCTION:

This report contains an inventory of regional engineering terrain conditions in the Pakashkan Lake map-area, Districts of Kenora, Rainy River, and Thunder Bay. The area, which covers NTS block 52G/SE, lies between Latitudes 49°00′N and 49°30′N and Longitudes 90°00′W and 91°00′W. The report forms part of a series of publications that provide similar terrain data for some 370 000 km^2 of northern Ontario.

The purpose of the inventory is to assist regional engineering and resource planning studies at a level of detail consistent with a scale of 1:100 000. The terrain information is contained on the Data Base Map (OGS Map 5065, accompanying this report).

---

[1]Consulting Engineering Geologist, J.D. Mollard and Associates Limited, Regina, Saskatchewan.

[2]Senior Consulting Engineer, J.D. Mollard and Associates Limited, Regina, Saskatchewan.

Manuscript approved for publication by the Chief, Engineering and Terrain Geology Section, November 6, 1979. This report is published with the permission of E.G. Pye, Director, Ontario Geological Survey.

Interpretation of black and white aerial photographs, at a scale of approximately 1:50 000, formed the basis of the terrain mapping process. The interpretation was checked against published and unpublished maps and reports which documented previous field visits and observations. During the fall of 1978, roads in the map-area were traversed and observed terrain conditions recorded as further verification of the office studies. Thus, the Data Base Map represents a reconnaissance overview of the engineering conditions of the terrain.

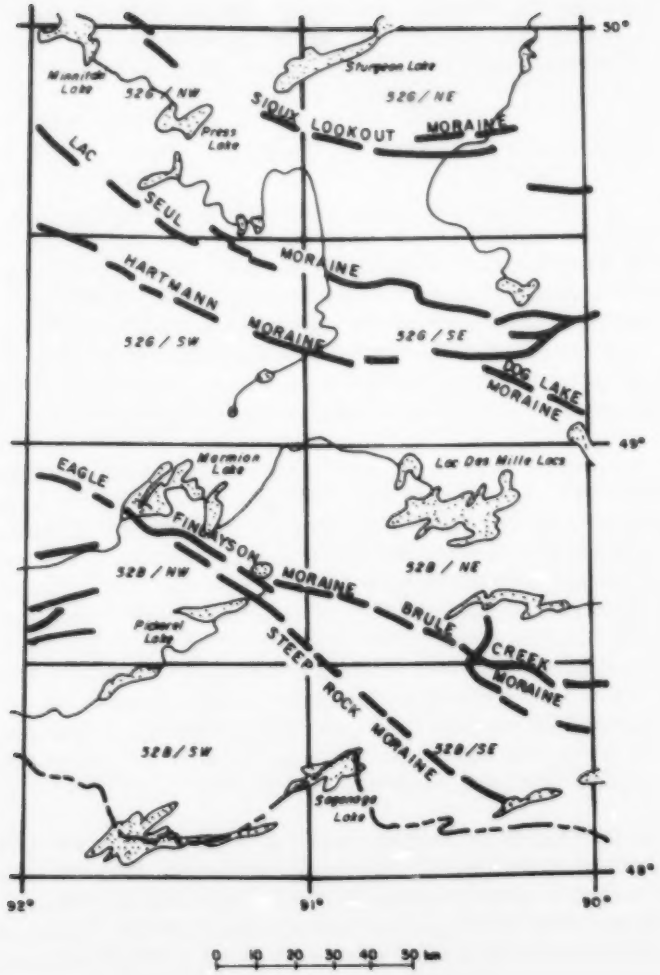
An engineering terrain legend was developed to facilitate the mapping and to provide a common information base for the entire map series. This legend is shown on the accompanying Data Base Map. Further discussion on the mapping techniques, legend format, and possible uses of this engineering geology information is available in the Ontario Engineering Geology Terrain Study Users' Manual (Gartner, Mollard, and Roed 1980), a companion publication to this series of maps and reports.

2.0 PHYSIOGRAPHY AND GEOLOGICAL SETTING:

Relief is moderate throughout most of the Pakashkan Lake map-area. Local relief is nearly always less than 50 m and is commonly less than 30 m. Rugged terrain borders the Firesteel River in the southwestern part of the area, where the local relief reaches 60 m.

A large morainal feature, called Hartmann Moraine, crosses the central part of the map-area in an easterly direction (Figure 1). The drift deposits are thicker in this map-area than in neighboring ones. Much of the area is covered by stratified drift deposits. Outwash sand and gravel, for example, are widespread except in the southwest quadrant, where extensive occurrences of bedrock and organic terrain are found. Even in this quadrant, however, outwash deposits occur along the south side of the Hartmann Moraine (Figure 1). Eskers are common in the northern half of the map-area, particularly in the region north of the Hartmann Moraine. Dunes occur throughout the southeastern quadrant, where large sandy outwash deposits are also found.

Bedrock in the Pakashkan Lake map-area consists mainly of Early Precambrian felsic igneous and metamorphic rocks (including granite,



NOTE: Moraine segments shown in the figure do not necessarily all occur on the Data Base Map accompanying this report.

FIGURE 1 - MAP SHOWING MAJOR MORAINES IN NTS 52B AND 52G (MODIFIED FROM ZOLTAI 1965, FIGURE 3)

syenite, porphyries, and gneisses). A narrow east-trending belt of metavolcanics and metasediments extends westward from Upsala across the southern part of the area. Another small belt of similar rocks occurs around Kearns Lake in the northeast corner of the area. Most terrain consisting of outcropping or near-surface bedrock is knobby.

3.0 ENGINEERING TERRAIN UNITS:

The engineering terrain units mapped are identified in terms of four components: surface material, landform, topography, and drainage. Format of the legend used in the terrain mapping is described in detail in the Users' Manual (Gartner, Mollard, and Roed 1980). Landform is a very important component because surface and near-surface materials, topographic expression, and the surface and internal drainage conditions are all related to it. Consequently, the engineering terrain units are grouped, for descriptive purposes, according to the dominant landform.

A particular landform can occur as the only component in a simple terrain unit, or as a dominant or subordinate component in a complex terrain unit. The dominant landform usually occupies more than half of a complex terrain unit. Where only one subordinate landform is shown, it usually occupies between 10 and 50 percent of the complex unit. Where two subordinate landforms are shown, the first covers the larger area. Landforms that occupy less than 10 percent of the terrain in a complex unit are rarely indicated in the terrain unit letter code. Where two or three landforms in a complex terrain unit consist of the same material, the landform letter symbols are connected by a dash. Examples of terrain unit letter codes which may occur in this map-area, and an explanation of each, are given in the Appendix.

A large number of complex terrain units has been mapped due to the widespread occurrence of irregular topography. Bedrock, which is situated at or near the ground surface throughout much of the map-area, controls the topography and therefore the surface drainage conditions. Resource development and engineering planning considerations are complicated by these complex conditions.

Noteworthy occurrences of important landforms are described with respect to location, typical materials, topography, and drainage; their significance in geotechnical investigations, regional engineering planning, and resource development is summarized.

3.1 BEDROCK KNOB (RN):

3.1.1 Description:

Bedrock knob landscape (RN) is characterized by an irregular bedrock surface having complex multiple slopes of varying steepness. The cover of glacial deposits overlying the bedrock knobs is generally thin and discontinuous. Much of the glacial overburden consists of bouldery, sand-rich till that was transported only a short distance by the ice.

3.1.2 Occurrence:

Bedrock-controlled topography is less common in the Pakashkan Lake map-area than in neighbouring map-areas due to the increased thickness of drift, particularly in the southeastern part. Bedrock knob terrain (RN) has been mapped in the vicinity of the Firesteel River and south of Hawk Lake in the southwestern part of map-area. Commonly associated subordinate landforms are ground moraine overlying bedrock (MG/R), organic terrain (OT), glaciofluvial outwash (GO), and organic terrain overlying outwash (OT/GO).

3.1.3 Engineering and Planning Significance:

Two principal engineering considerations are the large volumes of rock that must be excavated during construction and the generally uniform and solid foundation conditions at shallow depths. However, due to difficult topography and the existence of rock fractures, bedrock knob terrain is considered poor for most types of light construction and for waste disposal. Drilling and blasting are required during the construction of almost all types of engineering works.

3.2 BEDROCK RIDGE (RR):

3.2.1 Description:

The bedrock ridge unit (RR) consists of long, narrow, subparallel and intersecting bedrock ridges of varying height. Thickness of drift over the masked bedrock surface varies substantially over short distances. In, general, it is relatively thin (1 to 2 m) on ridge tops and thicker on the lower slopes and in the depressions between rock ridges.

3.2.2 Occurrence:

The most prominent expression of bedrock ridges (RR) is located west of Hawk Lake, near the western margin of the Pakashkan Lake map-area. Bedrock ridges also occur in a few places as a subordinate landform. Where it is the dominant landform, it is commonly associated with bedrock knobs and ground moraine overlying bedrock in a complex terrain unit mapped as RR(RN)(MG/R).

3.2.3 Engineering and Planning Significance:

The main construction problem is the large quantities of very hard rock that must often be excavated during construction. Drilling and blasting costs can be very high. Bedrock ridge terrain is considered poor for most types of engineering, construction, and resource development. It also has a low rating for waste disposal due to irregular relief, the presence of rock fractures near the ground surface, and the high cost of earthwork construction.

3.3 END MORAINE (ME):

3.3.1 Description:

End moraine (ME), which forms either prominent or inconspicuous till ridges, was deposited along the margin of the glacier. Although the ridges are usually long and narrow, they can be hummocky in places. End moraine consists largely of ice-deposited till and boulders, with minor inclusions

of water-laid silt, sand, and gravel. Segments of end moraine, composed mainly of till, occur with hummocky moraine (MH), kames (GK), and ice-contact deltas (GD) in large moraine complexes which are identified by name in Figure 1. The bedrock surface is nearly always buried in areas of end moraine; however, there are exceptions, and in a few places end moraine ridges have a core of solid rock.

3.3.2 Occurrence:

End moraine (ME) is the dominant landform along bouldery till segments of the Hartmann Moraine (Figure 1), particularly east of the settlement of English River in the western part of the area and south of Mirage Lake in the eastern part. Segments of the Hartmann Moraine that consist dominantly of till are mapped as end moraine; it occurs in close association with ice-contact deltas (GD) and kames (GK).

3.3.3 Engineering and Planning Significance:

An important characteristic of end moraine is its variability. Layers of unsorted and unstratified material of varying sizes (*i.e.* till) can both underlie and overlie sequences of layered silt, sand, and gravel. In general, the boulder content of this landform is high. End moraines in the map-area commonly exhibit variable permeability and internal drainage, low compressibility, and high bearing strength. The water table is low in end moraine rigdes. Where the unit consists of till that is high in sand- and gravel-sized material, and where sources of stratified sand and gravel are scarce, the coarse till may sometimes be crushed and used as a source of road surfacing material. End moraines may present excavation difficulties during the building of roads and structures due to the abundance of small and large boulders.

3.4 GROUND MORAINE (MG):

3.4.1 Description:

The term ground moraine (MG) refers to an extensive deposit of till forming an undulating to rolling plain. Although till is generally composed

of an assortment of particle sizes (including clay, silt, sand, gravel, cobbles, and boulders), till deposits in this map-area have a high sand and boulder content. The thickness of till in ground moraine varies from less than 1 m to many tens of metres. The landform is mapped as MG where the till is thick enough to mask any topographic effect of underlying bedrock. In, general, the till layer forms a mantle less than 3 m thick over the bedrock and is mapped as MG/R. Till in ground moraine tends to be thicker in bedrock depressions and thinner over bedrock ridges and knobs.

3.4.2 Occurrence:

Thick ground moraine till (MG) is rare in the Pakashkan Lake map-area, since the landform occurs mainly as a veneer over bedrock (MG/R). The discontinuous surficial layer of bouldery till is generally thicker north of Muskeg Lake in the southeastern part of the area and west of Carre Lake in the west-central part. The till material in these areas is usually thick enough to mask topographic effects of the underlying bedrock. Associated subordinate landforms are glaciofluvial outwash (GO) and organic terrain (OT). The thickness of till in areas mapped as MG/R averages less than about 3 m. A veneer of loess about 1 m thick overlies most ground moraine in the Pakashkan Lake map-area, particularly in the northern part.

3.4.3 Engineering and Planning Significance:

The till in ground moraine is coarse and bouldery, and has moderate permeability and internal drainage, low compressibility and high bearing strength. Water table position varies with relief, being lower beneath knolls and low ridges and higher beneath depressions. The till in many of the depressions is covered by thin deposits of peat and muck.

The suitability of ground moraine for road and other light foundation construction is fair to good. The fact that the till often forms only a thin veneer over the bedrock (MG/R) has a great deal of significance in road building. Road construction through this type of terrain is difficult owing to the bouldery nature of the till and the probability of encountering bedrock in cuts. The suitability of ground moraine for waste disposal varies from poor to fair.

3.5 HUMMOCKY MORAINE (MH):

3.5.1 Description:

Although some hummocky moraine deposits formed along an active ice front, most of the sediments which make up this landform accumulated on the surface of stagnant glacial ice. In time, the buried ice melted and deposited a layer of unsorted till and, in places, washed glacial debris. Most hummocky moraine consists of steep-sided knobs and short ridges separated by undulating to flat plains and swampy kettle hole basins. Soil materials in hummocky moraine include till, usually as the dominant constituent, and subordinate amounts of stratified silt, sand, and gravel in pockets or lenses. Hummocky moraine can be very bouldery. Scattered kames (GK) are a common subordinate landform.

3.5.2 Occurrence:

Areas of hummocky moraine (MH) are scattered along the Hartmann Moraine (Figure 1). One such area lies south of Little Petry Lake in the western part of the map-area. Perhaps the largest area containing hummocky moraine, in which it is mapped as a subordinate landform in a kame unit (GK), extends across the central part of the map-area, between the settlement of English River and Dora Lake. This knob and kettle terrain consists dominantly of kame moraine deposits, with subordinate areas of bouldery till in hummocky moraine, a unit which is mapped as (GK/MH). Another area in which hummocky moraine is mapped as a subordinate landform is located around McCausland Lake in the northern part of the map-area.

3.5.3 Engineering and Planning Significance:

Engineering considerations include the large quantities of material that may have to be excavated during construction, a high content of boulders, and rapid changes in the nature of the materials. Pockets of sand and gravel constitute small sources of construction material of variable quality.

Although variable, most areas of hummocky moraine have moderate permeability and internal drainage, low compressibility, high bearing strength,

and low shrink-and-swell potential. In depressions, the till deposits are commonly covered by thin water-laid silt and clay, which in turn are overlain by peat and muck deposits. Hummocky moraine is considered fair to poor for general construction purposes and for waste disposal.

3.6 ICE-CONTACT DELTA (GD):

3.6.1 Description:

Esker deltas, kame deltas, and delta moraines are all varieties of the ice-contact delta. Some are quite large in area and important in terms of the volume of recoverable sand and gravel which they contain. Individual beds, consisting mainly of sand or gravel, are usually better sorted, cleaner, and less variable than stratified deposits in esker (GE) and kame (GK) landforms. The beds in this unit are also typically less folded and faulted and are more continuous. It is worth noting that materials in many ice-contact deltas are coarse (*i.e.* gravelly) on the north and northeast sides and finer (*i.e.* sandy) on the south and southwest sides. These conditions indicate the parts of the delta which were, respectively, closest to and farthest from the glacial front against which the delta was built.

3.6.2 Occurrence:

Segments of the Hartmann Moraine (Figure 1) have been mapped as glacial deltas (GD). They are large, flat-topped, mesa-like areas with steep surrounding slopes. A large delta deposit located north of Marten Lake in the eastern part of the map-area contains numerous large kettle holes filled with water. Smaller deposits occur immediately east of the settlement of English River near the western margin of the area and around Fallscamp Lake in the central part. Elevation of these deposits ranges between 470 and 485 m.

3.6.3 Engineering and Planning Significance:

Ice-contact deltas are good potential sources of concrete and blacktop aggregate. They are also favorable sites for the construction of airstrips, roads, and other types of engineering works. Because the subsoils are

highly permeable, deltaic landforms are relatively poor areas for waste disposal. Large deposits, however, are generally good ground water prospects, especially where sand and gravel horizons are thick and extend below the water table. Ice-contact deltas possess high bearing strength and good workability in wet weather. Slopes are stable and subsoils are well drained. Away from the steeply sloping margins of this landform, earthwork volumes and excavation costs are normally low. Reservoirs and sewage lagoons in ice-contact deltas must be lined to prevent excessive leakage.

3.7 ESKER (GE):

3.7.1 Description:

The ridged landform represented by the esker symbol (GE, >>>) also includes crevasse fillings. Both occur as long, narrow, sand and gravel ridges that can be winding or straight and may widen in places. Some of these elongate ice-contact stratified drift ridges include braided, branching, beaded, and kettled segments. Most of the ridges trend roughly parallel to the last direction of glacial flow. The cores of many eskers and crevasse fillings contain complexly layered units, consisting of sandy gravel and gravelly sand, that exhibit collapse structures (*i.e.* folds, faults, and pinch-outs of strata). Some silt and find sand units (water-laid), boulders, and till pockets may occur within the central parts of eskers and crevasse fillings, as well as along their flanks.

3.7.2 Occurrence:

A large number of eskers occur in the Pakashkan Lake map-area, mainly in the northern half. Nearly all esker ridges are long and narrow, and trend in a northeasterly direction. Where eskers are too small to be properly outlined at the map scale, they are shown by the graphic symbol (>>>).

3.7.3 Engineering and Planning Significance:

Eskers and crevasse fillings are generally inferior to ice-contact delta and glacial outwash deposits as sources of good quality granular construction

materials. Typically, the unit possesses high permeability and good internal drainage, low compressibility, high bearing strength, low frost susceptibility, and low shrink-and-swell potential. Where esker ridges are steep sided, narrow, and winding, they may be unsuitable for use as transportation routes. They may trend in the wrong direction for route location purposes, but in regions that are dominated by large expanses of swamp and bedrock, eskers are frequently considered as good route location possibilities. Where the sand and gravel in large eskers extends many metres below the water table, the unit represents a potential source of ground water for domestic and, possibly, municipal and industrial use.

3.8 KAME (GK):

3.8.1 Description:

Kames occur either as steep-sided single knobs or as clusters of several knobs in kame fields and kame moraine. The larger, steep-sided kames usually have an irregular surface; in a few places, they contain deep kettle hole depressions. Most are composed of complexly interbedded sand and gravel strata which regularly exhibit fold, fault, and pinch-out structures. Kames also contain variable but usually minor amounts of silt, till, and boulders. Large kame deltas are discussed in Section 3.6; kame terraces are rare.

3.8.2 Occurrence:

The only significant occurrences of kame moraine (GK) in the Pakashkan Lake map-area are scattered along the Hartmann Moraine (Figure 1), where conical kames occur with large, flat-topped glacial deltas (GD). Although these deposits generally lie between elevations of 485 to 500 m, in places they may reach 530 m.

3.8.3 Engineering and Planning Significance:

In general, kames have high permeability and good internal drainage, low compressibility, high shear strength, and good bearing capacity. Position of the water table varies with relief, being nearer the surface beneath

kettle depressions and deeper beneath ridges and knobs. Although the granular materials in kames provide good foundations for buildings and small engineering works, the quantities of material that must be excavated during construction can be moderately high. Waste disposal sites require special design procedures and costly construction in order to function properly. Kames should be avoided as waste disposal sites. They vary from poor to good as sources of sand and gravel aggregate, depending upon their size and compositional variability.

3.9 OUTWASH PLAIN (GO):

3.9.1 Description:

Outwash deposits include plains, fans, deltas, and valley trains of varying sizes, all consisting mainly of sand and gravel. Most outwash sediments were drained from the front of a melting glacier and accumulated in flooded lowlands and valley bottoms. Although most outwash deposits formed in proglacial positions, some accumulated over masses of stagnant glacier ice, resulting in pitted or kettle surfaces. Outwash landscapes that show abandoned channel scars, braid bars, or deep kettle holes are commonly coarse in texture (*i.e.* gravelly and cobbly rather than sandy).

3.9.2 Occurrence:

Glacial outwash is the most common type of glaciofluvial landform in the Pakashkan Lake map-area. As either a dominant or subordinate landform, it covers at least half of the area. Many occurrences are located some distance from the Hartmann Moraine (Figure 1). The majority of outwash deposits contain high percentages of sand-sized material. Locally, however, outwash deposits adjoining major moraines can be very coarse.

Large outwash deposits are located in the northwestern part of the map-area. Smaller deposits occur in the southeastern part and across the central part near the Hartmann Moraine, particularly in the vicinity of Sharp Lake and Marten Lake. In these latter localities, the deposits are generally coarser.

3.9.3 Engineering and Planning Significance:

Outwash landforms almost always have high permeability and good internal drainage, low to very low compressibility, low shrink-and-swell tendencies, and high shear strength and bearing capacity, particularly where these granular deposits are confined. Granular materials in outwash landforms form stable slopes and are seldom susceptible to frost heave. Being level and well drained, the sediments in outwash plains are not easily eroded by running water. The boulder content is generally low. A high water table can be expected beneath kettle depressions. Extensive outwash plains provide excellent sites for the construction of roads and airstrips, and are often good sources of concrete and bituminous aggregate. They are good potential sites for ground water development, particularly where the granular deposits are deep and are recharged by water from nearby lakes and rivers.

3.10 ALLUVIAL PLAIN (AP):

3.10.1 Description:

Many alluvial deposits (AP) in this map-area consist of fine and medium sand at depth; these materials are commonly overlain by a silty upper stratum of variable thickness. Oxbows and abandoned channel segments occur where meandering streams cross landforms composed largely of loose silt and fine sand. Sediments beneath alluvial plains are finer textured where the material being carried by the stream was eroded from clay and silty clay glaciolacustrine deposits. The landform includes flood plains that have been eroded in till and are strewn with boulders, as well as segments of stream valleys where alluvial sediments range in texture from coarse sand to coarse gravel and cobbles. Long and complex alluvial plain systems sometimes include three constituent landforms: low alluvial terraces, alluvial flood plains, and stream channels.

3.10.2 Occurrence:

Few alluvial plains (AP) are found in the Pakashkan Lake map-area. Substantial deposits occur along the English River in the western part of the area, the Firesteel River in the southeastern part, the Petry River

in the west-central part, and the McCausland River in the northwestern part. Sand deposits beneath the flood plains of the Firesteel and Seine Rivers have been mapped as alluvial in origin, even though they may be partly lacustrine.

3.10.3 Engineering and Planning Significance:

Alluvial plains are subject to flooding. The water table is usually situated at or near the surface for much of the year; organic-filled depressions are common. Although some alluvial terraces, flood plains, and channel bottoms represent potential sources of sand and gravel for construction purposes, the high water table may cause problems during excavation of such materials. This landform is generally unsuitable for transportation routes, general construction, or waste disposal sites because of the high water table and risk of flooding.

3.11 SAND DUNE (ED):

3.11.1 Description:

Dunes are composed of fine and medium sand that has been blown into ridges by wind action. Dune ridges range in height from 1 or 2 m to more than 5 m, and may be long, narrow, and straight or arrowhead, or arcuate in outline. Dunes usually overlie or occur downwind from sandy outwash plains and sandy glaciolacustrine plains.

3.11.2 Occurrence:

A large tract of sand dunes located northeast of Upsala covers most of the southeastern quarter of the map-area. These dunes overlie sandy deposits washed out from the glacier which built the Hartmann Moraine. The relief in the dunes is quite variable in places, even though the broad topographic aspect of the area is level or gently undulating. The Canadian National main line crosses this large expanse of dunes.

A smaller patch of sand dunes is located north of the Firesteel River in the southeastern part of the map-area. Here fine and medium sands have been blown over till and bedrock.

3.11.3 Engineering and Planning Significance:

Sand dunes possess special characteristics which are of engineering significance. When denuded of vegetation, the fine and medium sand in dune ridges is susceptible to wind erosion and drifting. A moderate to low water table can be expected beneath higher dune ridges. Dunes are well drained, and the sand of which they are composed has a low strength when it is not confined. These deposits usually have low compressibility unless sand of a relatively uniform grain size has been deposited in a very loose state. Where dune sand is loose, generally beneath the slip face, it may possess a moderate to low relative density. The bearing strength of dune material is also low where the sand is unconfined, but can increase with the degree of confinement. Caving of wet and dry sand in vertical ditch walls is a potential problem which can increase costs on major construction jobs. Dune sand is nonplastic and is generally not susceptible to frost action or shrinking and swelling. Dunes provide a good source of sub-base material for highway pavement structures. Moreover, dune terrain can usually be worked in wet weather.

3.12 ORGANIC TERRAIN (OT):

3.12.1 Description:

Organic terrain includes varying depths of peat and muck in marshes, swamps, fens, and bogs. No attempt was made to separate these organic landscape types during the mapping. Although peat and muck deposits usually occur as relatively thin surficial layers, in places these organic materials can be several metres thick. Moreover, the thickness of the deposits can change drastically over very short distances.

3.12.2 Occurrence:

Sizeable deposits of organic terrain (OT) are scattered throughout the Pakashkan Lake map-area, particularly the western half. The largest

deposit, part of which forms only a thin veneer over glaciofluvial outwash deposits (OT/GO), is located in Trewartha and Meinzinger Townships, in the southwestern part of the area. Thin organic deposits overlie alluvial sediments (OT/AP) along several rivers in the area, particularly the McCausland and Petry Rivers in the northwestern part and the Little Sayanne River in the southeastern part. Organic terrain can occur as a subordinate landform in glaciofluvial units (GK, GO), ground moraine (MG), and where ground moraine occurs as a thin veneer over bedrock (MG/R).

3.12.3 Engineering and Planning Significance:

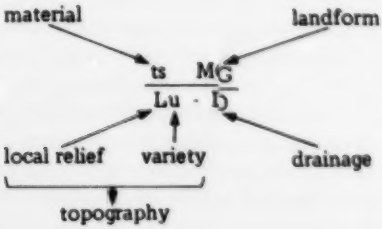
Although organic deposits are commonly thin, they are nonetheless very poor foundation and construction materials. The water table is at or near ground surface for most of the year. The locations of deeper pockets of organic material are difficult to predict reliably without extensive test-drilling. The topography of organic terrain is level or slightly depressional. Peat and muck deposits have low shear and bearing strengths and generally low permeability. They are nearly always poorly drained, highly compressible, and are subject to seasonal flooding. Consequently, they are unsuitable for nearly all types of engineering works and for waste disposal.

4.0 APPENDIX: EXAMPLES OF TERRAIN UNIT LETTER CODES:

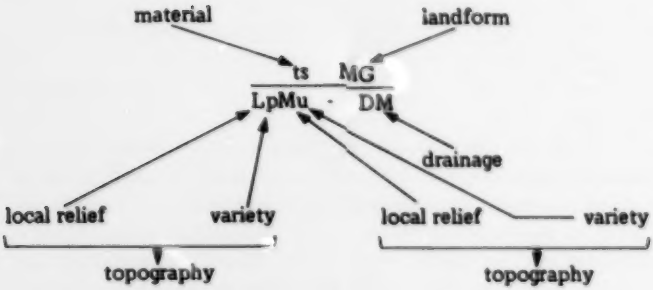
The engineering terrain unit letter codes consist of four components: surface materials, landform, topography, and drainage. The format of the letter codes used in describing the terrain units is discussed in detail in the Users' Manual (Gartner, Mollard, and Roed 1980). Some additional examples of the letter codes are as follows:

4.1 SIMPLE TERRAIN UNIT:

Example 1:



Example 2:

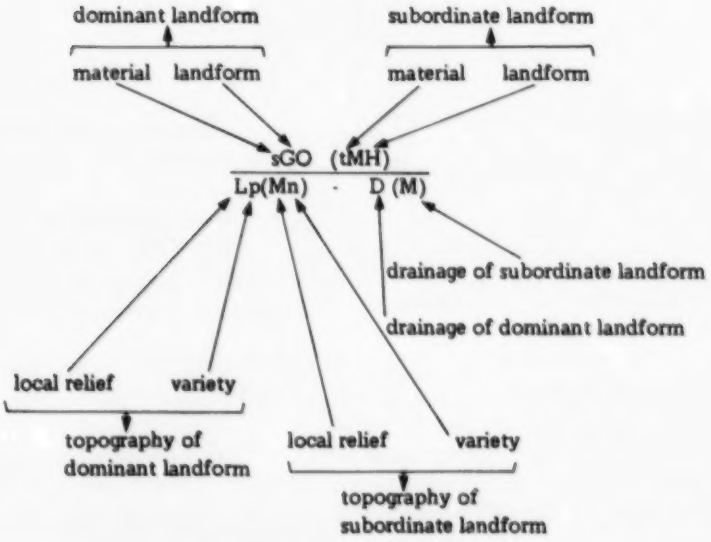


Note: The above type of letter code is used where there are two distinctly different types of topography and/or drainage in a simple terrain unit.

4.2 COMPLEX TERRAIN UNIT:

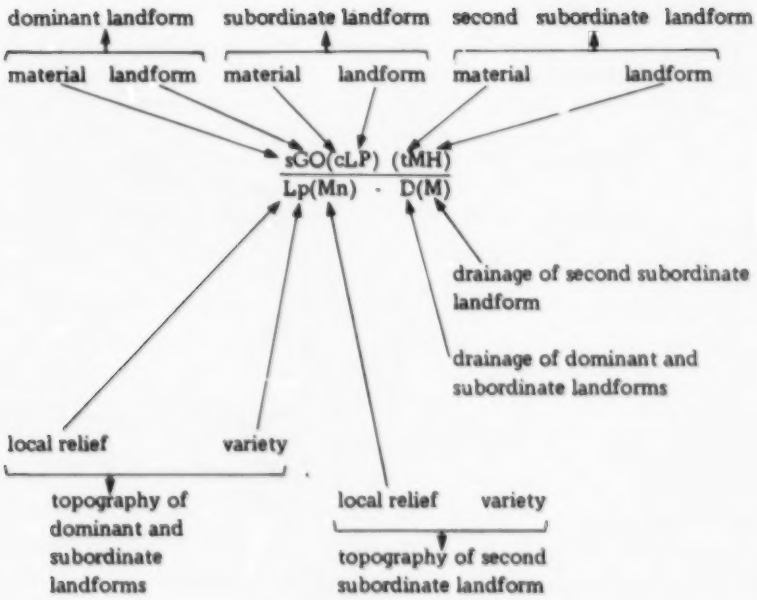
In complex areas, the dominant landform is shown first and the subordinate landform(s) appear in parentheses.

Example 1:



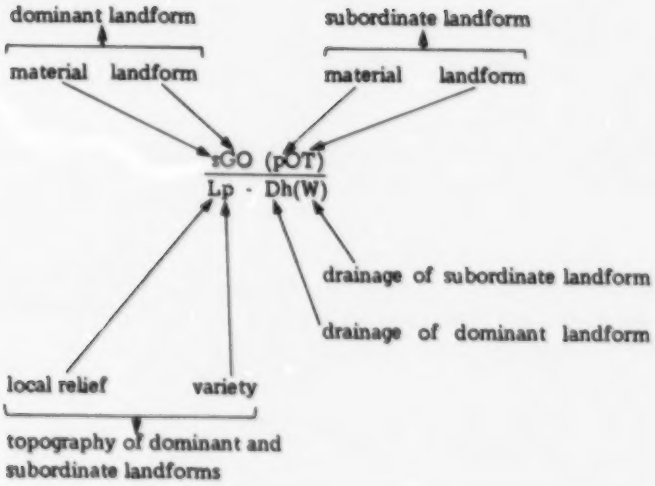
Note: The topography and drainage in parentheses refer to the landform shown in parentheses.

Example 2:



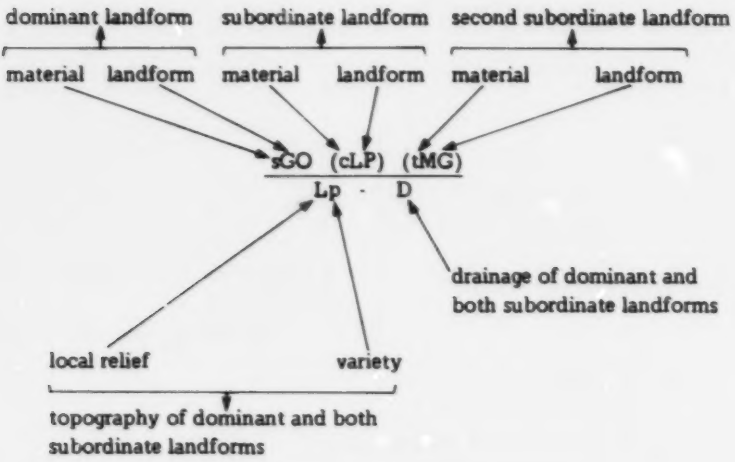
Note: The topography and/or drainage in parentheses refer to the second subordinate landform (in parentheses).

Example 3:



Note: If topography or drainage is similar in the dominant and subordinate landforms, then no topography or drainage symbol is shown in parentheses and the symbol shown applies to both landforms. If topography or drainage conditions are different in one of the landforms, a topography or drainage symbol is shown in parentheses to indicate this difference.

Example 4:



Note: Where topography and drainage conditions are similar in all of the landforms shown, no topography or drainage symbols are placed in parentheses.

5.0 REFERENCES:

Douglas, R.J.W.

1969: Geological Map of Canada; Geological Survey of Canada, Map 1250A, scale 1:5 000 000. Compiled 1966, 1967.

Farrand, W.R.

1960: Former Shorelines in Western and Northern Lake Superior Basin; Unpublished Ph.D. Thesis, University of Michigan, Ann Arbor, 226p.

Fremlin, G. (Editor)

1974: The National Atlas of Canada, Fourth Edition (Revised); McMillan Company of Canada Limited in association with the Canada Department of Energy, Mines and Resources and Information Canada, 254p.

Gartner, John F., Mollard, J.D., and Roed, M.A.

1980: Ontario Engineering Geology Terramin Study Users' Manual; Ontario Geological Survey, Open File Report 5288, 99p.

Ontario Land Inventory

1976: Land Classification, Quetico, 52G, Edition 2 MCE, Series A501; Ontario Centre for Remote Sensing, Ministry of Natural Resources.

Prest, V.K.

1969: Retreat of Wisconsin and Recent Ice in North America; Geological Survey of Canada, Map 1257A, scale 1:5 000 000. Compiled 1969.

Prest, V.K., Grant, D.R., and Rampton, V.N.

1968: Glacial Map of Canada; Geological Survey of Canada, Map 1253A, scale 1:5 000 000. Compiled 1964-1966.

Pye, E.G.

1968: Geology and Scenery, Rainy Lake and East to Lake Superior; Ontario Department of Mines, Geological Guidebook No.1, 118p.

1969: Geology and Scenery, North Shore of Lake Superior; Ontario Department of Mines, Geological Guidebook No.2, 144p. (Reprinted 1975).

Pye, E.G., and Fenwick, K.G.

1965: Atikokan - Lakehead Sheet, Kenora, Rainy River, and Thunder Bay Districts; Ontario Department of Mines, Map 2065, Geological Compilation Series, scale 1:253 440 or 1 inch to 4 miles. Geological compilation 1962, 1963.

Zoltai, S.C.

1962: Glacial History of Part of Northwestern Ontario; Proceedings of the Geological Association of Canada, Vol.13, p.61-83.

1965a: Glacial Features of the Quetico - Nipigon Area, Ontario; Canadian Journal of Earth Sciences, Vol.2, No.4, p.247-269.

1965b: Surficial Geology, Thunder Bay; Ontario Department of Lands and Forests, Map S265, scale 1:506 880 or 1 inch to 8 miles. Surficial geology 1958-1960.

MAPS
NOT
FILMED

CARTES
OMISES